Applying Howard Gardner's Multiple Intelligences to a Fifth Grade Mathematics Curriculum

An Honors Thesis (Honors 499)

by

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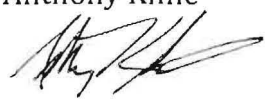

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Abstract

For years people have attempted to develop new techniques for how children learn. Howard Gardner developed the theory of multiple intelligences. His original seven intelligences included linguistic, logical, spatial, musical, intrapersonal, interpersonal, and bodily kinesthetic. Howard Gardner's multiple intelligences received both positive and negative reviews. I attempted to create a two-week mathematics curriculum for fifth grade which integrates Gardner's intelligences in order to understand how Gardner's intelligences affect students.

Acknowledgements

I would like to thank my advisor for his support and guidance through the long process of completing my thesis. His advice and knowledge of multiple intelligences helped bring my paper together. I would also like to thank my student teaching supervisor for her guidance regarding the LAMP project format. Finally, I would like to thank my student teaching classroom teacher for allowing me to use his class to teach this unit.

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Author's statement

For my honor's thesis, I chose to create a teaching unit for fifth grade that would utilize Howard Gardner's seven primary multiple intelligences: linguistic, logical, musical, spatial, intrapersonal, interpersonal, and kinesthetic. Since I was student teaching during the same semester that I was completing my honors thesis, I wanted to create a unit that I could actually teach to my students. Before I started planning my unit, I researched the different intelligences and how to represent each one in my unit. The following is a short description of each intelligence, according to Howard Gardner's *Multiple Intelligences: The Theory in Practice*:

Linguistic: The linguistic intelligence is the ability to use language for critical thinking. The development of language in children is quite constant across cultures. Most cultures have some form of language in their community; even deaf populations use some form of sign language, whether traditional or invented, to communicate.

- "Learns best by saying, hearing and seeing word" (Gardner, 21)

Logical: The logical intelligence is another type of intelligence that is common in almost every culture. Certain areas of the brain are used more specifically for mathematical calculations than others. For example, some people can perform extremely mathematical calculations, but suffer severely in other areas.

- "Learns best by categorizing, classifying and working with abstract patterns/relationships" (Gardner, 19-20)

Spatial: This intelligence enables the ability to find one's way around a city, to recognize faces, or to notice fine details. The right hemisphere has been proven to be the area in the brain most used for spatial processing.

- "Learns best by visualizing, dreaming, using the mind's eye and working with colors/pictures" (Gardner, 21-22)

Kinesthetic: This intelligence is represented by the ability to problem solve by using the body to express an emotion (as in a dance), to play a game (as in a sport), or to create a new product (as in devising an invention).

- "Learns best by touching, moving, interacting with space and processing through bodily secretions" (Gardner, 18-19)

Interpersonal: The student with strengths in interpersonal intelligence notices distinctions among others, especially contrasts in their moods, temperaments, motivations, and intentions. This skill appears in religious or political leaders, teachers, therapists, and parents.

- "Learns best by sharing, comparing, relating, cooperating and interviewing" (Gardner, 22-23)

Intrapersonal: Intrapersonal intelligence is the knowledge of the internal aspects of a person, including access to one's own feeling life, one's range of emotions, the capacity to effect discriminations among these emotions and eventually to label them and to draw upon them as a means of understanding and guiding one's own behavior. Since this intelligence is the most private, it often requires evidence from language, music, or some other more expressive form of intelligence if the observer is to detect it at work.

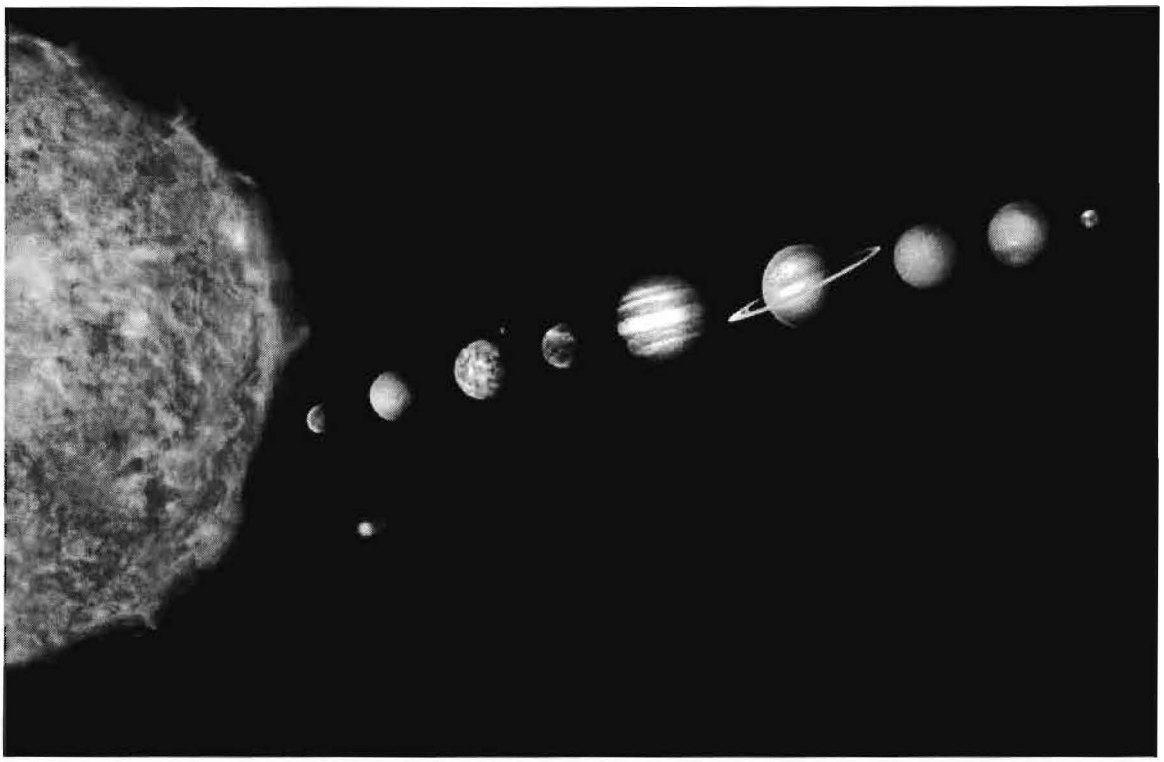
- "Learns best by working alone, individualized projects, self-paced instruction and having own space" (Gardner, 24-25)

Musical: Certain parts of the brain play important roles in perception and production of music. These areas are characteristically located in the right hemisphere, although musical skill is not as clearly localized, or located in a specifiable area, as language.

- "Learns best by rhythm, melody, and music" (Gardner, 17-18)

My goal for creating this curriculum unit was to show how students do not always learn best from traditional intelligence. The traditional intelligence is having the ability to answer items on an intelligence test. I hoped that my unit would show that students learned best through multiple intelligences, which basically means that intelligence entails the ability to solve problems or fashion products. Therefore, for my unit, I had my student create a game board that would demonstrate the students' intelligence dealing with the material they had learned throughout the unit. In order to compare how well my students learned through multiple intelligences, I gave them a pre and post-test. Although I know that all the information about multiple intelligences states that tests are not the best representative of intelligence, most schools still rely on traditional tests to compare students and observe growth. Therefore I decided that I should still give a traditional test so that I prove that by teaching using multiple intelligences, the students can take a traditional test and show improvement. In order to complete my unit on "Division Through the Solar System", I tried to incorporate many multiple intelligences into each lesson. Each lesson used a variety of strategies, such as musical and hands-on manipulatives.

Division Through the Solar System



A Two-Week Interdisciplinary Unit

Miss Katie Riley

Fall 2011

Grade 5

Math- Monday (Day 1)

(Interpersonal, Spatial, Linguistic, Logical Intelligences)

Katie Riley Fifth Grade

Mathematics/Dividing Multiples of 10 and 100 10/3/2011

NM- NUM. K-12.2 Number and Operations: Students understand meanings of operations and how they relate to one another.

Math Standard 2
Computation
Students solve problems involving multiplication and division of whole numbers and solve problems involving addition, subtraction, and simple multiplication and division of fractions and decimals.

MATH.5.2.1 Solve problems involving multiplication and division of whole numbers fluently using a standard algorithmic approach and explain how to treat the remainders in division.

1. Materials

- White boards
- Workbook
- BrainPOP division clip:
  http://www.brainpop.com/math/numbersandoperations/division/
- Computer and Projector
- Yellow ball

2. Objective

Students find the quotient of a division problem whose dividend is a multiple of 10, where division involves a basic fact.

3. Motivation

Watch the *BrainPOP* video about division. This video demonstrates the primary principles of division with examples.

4. Goal for Learner

Today you will be learning how to use mental math to divide multiples of 10 and 100 by a one-digit number.

5. Content and Procedures

- Watch the BrainPOP video about division
- As a class, discuss some of the important information discussed in the video
- Ask the class what are some things that come in really big numbers that we might want to divide. (Candy in a candy store, blades of grass etc)
- After establishing the importance of being able to divide really big numbers mentally, give the students the problem: Over the past 3 years, scientists have spotted about 24,000 meteorites in space. How many did they spot in one year? Have the students try to solve this problem with any method.
- Remind them that division is the opposite of multiplication (3 X 8 =24 and 24/3 = 8)

- Once some of the students have shared their responses and techniques for the story problem, show the students how to break up the problem into smaller parts: 24/3=8, 240/3=80, 2400/3=800, 24,000/3=8000
- Explain to the students that when dividing numbers with multiple zeros, you can take off the zeros to initially divide, and then add the zeros to your final quotient.
- Write an example of the progression of dividing 49,0000/7 (49/7=_____, 490/7=_____, etc)

6. Practice/Application

- Bring in yellow ball to represent the sun.
- Write the diameter of the sun in inches on the board
- As a class, measure the diameter of the yellow ball (I will choose a ball that is small enough to have a one-digit diameter.)
- Challenge the students to find out how much smaller the ball is from the actually size of the sun.

7. Evaluation of student learning

I will observe the students solving the problem about the sun. After the lesson, I will collect their work and determine whether the student showed their work and got the correct answer.

8. Closure

Bring the class back together as a group. Ask the class the following questions in order to conclude the lesson and to check for student understanding:

- How do you divide numbers by ten?
- How do you divide numbers that have zeros at the end of both the divisor and the quotient?
- How would you use division in your everyday life?

Science-Monday (Day 1 part 2)
(Interpersonal, Linguistic, Spatial Intelligences)

Katie Riley Fifth Grade

Science- What is the Solar System? 10/3/2011

NS- Earth and Space Science- Earth and space science focuses on science facts, concepts, principles, theories, and models that all students know, understand, and use.

M.D.3 EARTH IN THE SOLAR SYSTEM. b: Most objects in the solar system are in regular and predictable motion. Those motions explain such phenomena as the day, the year, phases of the moon, and eclipses.

Science Standard 3
The Physical Setting
Students continue to investigate changes of Earth and the sky. They explore, describe, and classify materials, motion*, and energy*.

SCI 5.3.1 Explain that telescopes are used to magnify distant objects in the sky, including the moon and the planets.

1. Materials

- Plastic cups
- Textbook
- Pictures of objects in space (planets, galaxies, asteroids, comets, stars, etc)
- Bill Nye the Science Guy video: http://www.youtube.com/watch?v=BdAqq-wEQV0&feature=related
- Class computer and projector
- United Streaming: Welcome to the Milky Way and Other Heavenly Bodies: Asteroids, Meteors, and Comets http://player.discoveryeducation.com/index.cfm?guidAssetId=90ce76df-2e45-404b-a331-2f6d132bd0d0&blnFromSearch=1&productcode=US

2. Objective

The students will identify objects that are present in out solar system and galaxy.

3. Motivation

Using plastic cups, create a 3-d model of the Milky Way (a spiral galaxy). Have the students observe the model from different directions.

4. Goal for Learner

Today you will learn about the different objects that are in our solar system and galaxy.

5. Content and Procedures

- Explain to the students what a galaxy is and the different types (spiral galaxies are like our galaxy). Refer the students back to the model on the floor. Show the students how the look of the model changes depending on where you are standing.
- Ask the students "If you were an astronaut soaring through space, what are some of the things you might find in our galaxy, the Milky Way?" (Planets, sun, comets, asteroids, and meteors)
- Introduce vocabulary to students: Galaxies, Milky Way, stars/sun, planets, solar

system, comets, asteroids, and meteors. Have the students use a graphic organizer to record facts about each object in the solar system.

- Watch the United Streaming videos then discuss the distance in relationship to the galaxy and the solar system, and the sun and the planets.

6. Practice/Application

- Give the students a worksheet that lists the actual distance between the sun and the planets as well as well-known comets, asteroids, and meteors.
- The students will need to use division of tens and hundreds to reduce the distance between the sun and the objects into a more identifiable distance.
- Tomorrow we will use these scaled down distances in order to make our own version of the solar system.

7. Evaluation of student learning

I will use informal questioning in order to evaluate whether the students understand the various objects found in space. Their graphic organizers will also help to evaluate student learning.

8. Closure

Watch a video by Bill Nye the Science guy to demonstrate the vast distance among planets. Ask the following questions to evaluate student learning and to conclude the lesson:

- What are objects that you might find in our solar system?
- What are a meteor, comet, and asteroid?
- What is the difference between a meteor and a meteorite?
- How would you rank universe, Milky Way, Solar System, and Earth from largest to smallest?

Math/Science-Tuesday (Day 2)

(Kinesthetic, Intrapersonal, Interpersonal, Logical, Linguistic Intelligences)

Katie Riley Fifth Grade

Mathematics/Estimating Quotients 10/4/2011

Math standard 2
Computation
Students solve problems involving multiplication and division of whole numbers and solve problems involving addition, subtraction, and simple multiplication and division of fractions and decimals.

MATH 5.2.1 Solve problems involving multiplication and division of whole numbers fluently using a standard algorithmic approach and explain how to treat the remainders in division.

Math Standard 7
Problem Solving
Students make decisions about how to approach problems and communicate their ideas.

MATH 5.7.6 Know and apply appropriate methods for estimating results of rational-number computations.

Science Standard 3
The Physical Setting
Students continue to investigate changes of Earth and the sky. They explore, describe, and classify materials, motion*, and energy*.

SCI 5.3.1 Explain that telescopes are used to magnify distant objects in the sky, including the moon and the planets.

1. Materials
- String
- Distance worksheet
- White boards

2. Objective
Students use rounding and compatible numbers to estimate quotients of whole numbers

3. Motivation
Have the class pretend to be astronomers who have spent the last 4 years observing objects in space. Ask the class what kind of objects they have spotted.

4. Goal for Learner
Today you will be learning how to estimate quotients.

5. Content and Procedures
- We will spend ten minutes reviewing the information from the day before by checking the students' distance worksheet and measuring out the distances using

string in order to demonstrate the vast distance of the solar system.

- After discussing/reviewing objects found in space, give the student a problem similar to the following: Astronomers have spotted 442 objects in space within the past 4 years. About how many objects would they have observed in 1 year?
- Remind the class how to estimate numbers to the tens and hundreds place value. Tell the students that an estimated quotient is important for times when you do not have time to figure out the entire problem (ask the class for an example of when else you would need to estimate a quotient). Explain compatible numbers: 45 is divisible by 5 so round to 45 not 46 or 44.
- Using the problem above, show the students how to round 442 to 440 or 400.
- Then solve the problem.
- Give the students the same problem but with different amounts of objects and years.
- Have the students show their answers on their white boards.

6. Practice/Application

- Students will play "Estimation Division Connect 4" in groups of 4.
- This game involves students quickly estimating quotients from division cards and placing the card over a square that has an appropriate range for that estimated quotient.

7. Evaluation of student learning

As the students are playing the game, I will be walking around to observe that they are correctly using the concept of estimation. I will also use the closure of an informal Q&A to determine what information the students learned about today.

8. Closure

Ask the students the following questions to conclude the lesson and to determine student learning:

- What did you notice about the distance of the planets when we spaced out the distance from the sun using string?
- Why would we want to round numbers in a division problem?
- What does it mean to estimate a problem?

Science-Wednesday (Day 3 part 2)

(Linguistic, Spatial, Intrapersonal, Interpersonal Intelligences)

Katie Riley Fifth Grade

Science- What is the sun? 10/5/2011

Science Standard 3
The Physical Setting
Students continue to investigate changes of Earth and the sky. They explore, describe, and classify materials, motion*, and energy*.

SCI 5.3.2 Observe and describe that stars are like the sun, some being smaller and some being larger, but they are so far away that they look like points of light.

SCI 5.3.3 Observe the stars and identify stars that are unusually bright and those that have unusual colors, such as reddish or bluish.

English Standard 4
WRITING: Processes and Features
Students discuss and keep a list of ideas for writing. They use graphic organizers. Students write clear, coherent, and focused essays. Students progress through the stages of the writing process and proofread, edit, and revise writing.

ELA 5.4.1 Discuss ideas for writing, keep a list or notebook of ideas, and use graphic organizers to plan writing.

ELA 5.4.11 Use logical organizational structures for providing information in writing, such as chronological order, cause and effect, similarity and difference, and stating and supporting a hypothesis with data.

1. Materials

- Textbook
- Pictures of different types of stars
- Star comparison graphic organizer
- NASA video:
  http://www.nasa.gov/audience/foreducators/nasaeclips/search.html?terms=&category=1000
- Magic School Bus video:
- http://player.discoveryeducation.com/index.cfm?guidAssetId=5615365B-1670-45F2-9788-F453107C025B&blnFromSearch=1&productcode=US
- Class computer and projector

2. Objective

The students will determine the similarities and differences between stars.

3. Motivation

Have the students watch a NASA video about the sun

4. Goal for Learner

Today you will learn about the different types of stars present in space and their similarities and differences.

5. Content and Procedures

- After watching the NASA video about the sun, ask the class what are a few things that they learned from the video.
- Use an interactive PowerPoint to show the types of stars and their similarities and differences.
- Using the PowerPoint, we will discuss how stars, like our sun are balls of fire; make up constellations in the sky; all except our sun, are too far away to see; have sunspots and solar flares.

6. Practice/Application

- The students will then be given a graphic organizer where they will compare the different types of stars. Use this time to talk about the different types of graphic organizers and their purposes. (web organizer, Venn diagram, compare and contrasting organizer. While the students are creating their graphic organizer, they will watch a clip about the stars from *The Magic School Bus: Sees Stars* or BrainPOP: Constellations.

7. Evaluation of student learning

While teaching, I will use informal questioning in order to determine whether the students understand the material. I will also use the graphic organizer to determine the students' competency.

8. Closure

Split the class into thirds; give each group a type of star (blue, yellow, or red). Together as a group, they will decide upon two important/significant facts about that star to share with the class. Afterwards, I will ask the class if there is anything else that we learned today that was not shared already. The students' homework assignment will be to observe the stars during the night and draw a picture or take a photograph of what you observed.

Math/Science- Wednesday (Day 3 part 1)

(Linguistic, Logical, Kinesthetic, Spatial, Intrapersonal, Interpersonal, Intelligences)

Katie Riley Fifth Grade

Mathematics/Reasonableness/orbits 10/5/2011

Math Standard 2
Computation
Students solve problems involving multiplication and division of whole numbers and solve problems involving addition, subtraction, and simple multiplication and division of fractions and decimals.

MATH 5.2.1 Solve problems involving multiplication and division of whole numbers fluently using a standard algorithmic approach and explain how to treat the remainders in division.

MATH 5.2.6 Use estimation to decide whether answers are reasonable in addition, subtraction, multiplication, and division problems.

Math Standard 7
Problem Solving
Students make decisions about how to approach problems and communicate their ideas.

Math 5.7.1 Analyze problems by identifying relationships, telling relevant from irrelevant information, sequencing and prioritizing information, and observing patterns.

Math 5.7.5 Recognize the relative advantages of exact and approximate solutions to problems and give answers to a specified degree of accuracy.

Science Standard 3
The Physical Setting
Students continue to investigate changes of Earth and the sky. They explore, describe, and classify materials, motion*, and energy*.

SCI 6.3.1 Compare and contrast the size, composition, and surface features of the planets that comprise the solar system, as well as the objects orbiting them. Explain that the planets, except Pluto, move around the sun in nearly circular orbits.

English Standard 4
WRITING: Processes and Features
Students discuss and keep a list of ideas for writing. They use graphic organizers. Students write clear, coherent, and focused essays. Students progress through the stages of the writing process and proofread, edit, and revise writing.

ELA 5.4.10 Edit and revise writing to improve meaning and focus through adding, deleting,

combining, clarifying, and rearranging words and sentences.

1. **Materials**
   - Chocolate bars
   - Orbiting sun and Earth planetarium
   - White boards
   - Workbook
2. **Objective**

Students check problems for reasonableness by using various methods, including estimation and checking their final answer.

3. **Motivation**

Bring in three chocolate bars to demonstrate a remainder. Tell the class that I want to give each student 1 piece of chocolate. Since there are 12 pieces of chocolate in each package, the class will need to figure out that 3 packages are needed, because with just two packages, there is not enough chocolate for the whole class.

4. **Goal for Learner**

Today you will be learning to check the reasonableness of the answer to a division problem involving a remainder.

5. **Content and Procedures**
   - Talk to the students about the meaning of a remainder. Demonstrate the meaning of a remainder by using the chocolate example and how to interpret the remainder (round the quotient up or down)
   - Show the students how to multiply to check their answers.
   - Explain to the students about orbits and how the planets orbit the sun (one year equals one orbit/revolution).
   - As an example, tell the students that in 1,461 days, the Earth orbits the sun 4 times. Therefore, in one year, the Earth orbits the sun in 365R1 days. Use reasonableness to show that we round the days in a year to 365 days and on the fourth year, have an extra day (leap day)
6. **Practice/Application**
   - The students will write and perform a skit that represents a problem that shows reasonableness. Use this time to talk about how writing should have a beginning, middle, and end, so their skit should have all three parts.
7. **Evaluation of student learning**

I will be observing the students throughout the entire lesson in order to determine student learning. Their skits will also demonstrate understanding of the material.

8. **Closure**

The students' skits will help conclude the lesson. After the skits, ask the students the following questions to review what was learned during the lesson:

- What does the remainder show in a word problem?
- How can you use the remainder to show reasonableness when solving a word problem?

Math- Thursday (Day 4)
(Interpersonal, Intrapersonal, Kinesthetic, Spatial, Logical, Linguistic, Musical Intelligences)

Katie Riley — Fifth Grade

Mathematics/Connecting Models and Symbols — 10/6/2011

Math Standard 2
Computation
Students solve problems involving multiplication and division of whole numbers and solve problems involving addition, subtraction, and simple multiplication and division of fractions and decimals.

MATH 5.2.1 Solve problems involving multiplication and division of whole numbers fluently using a standard algorithmic approach and explain how to treat the remainders in division.

Math Standard 7
Problem Solving
Students make decisions about how to approach problems and communicate their ideas.

MATH 5.7.1 Analyze problems by identifying relationships, telling relevant from irrelevant information, sequencing and prioritizing information, and observing patterns.

MATH 5.7.5 Recognize the relative advantages of exact and approximate solutions to problems and give answers to a specified degree of accuracy.

MATH 5.7.9 Note the method of finding the solution and show a conceptual understanding of the method by solving similar problems.

1. Materials
- Play money (hundreds, tens, and ones)
- White boards
- Workbook

2. Objective
Students find quotients using the model of sharing money.

3. Motivation
Give students a packet of play money. Tell them the following word problem: if NASA has $876 to build 3 test rockets, how much money can NASA use for each rocket. Allow the students to use the money to try to solve this problem.

4. Goal for Learner
Today you will learn how to model the division of a three-digit number by a one-digit number.

5. Content and Procedures
- After the students have had a few minutes to try to solve the sample problem, help the students solve the problem by telling the students to label on their white boards:

rocket 1, rocket two, and rocket three.

- Tell the students to evenly divide the 100-dollar bills amongst the three rockets. With the extra 100-dollar bills, show the students how to transform it to 10 ten-dollar bills. Continue this strategy with the tens and one-dollar bills.
- Give the class another example where there are four test rockets to build instead of three. The students will use the same method to try to solve this problem. Check with their group to make sure that they all understand the problem.

6. Practice/Application

- Next, have the students write their own division story problem, using 3 100-dollar bills, 6 ten-dollar bills, and 7 one-dollar bills. Before they begin, discuss with the students the important aspects of a story problem.
- Once the students have written their word problem, trade with their group members to solve each other's problems using the play money.
- To conclude the lesson, give the students a standard division algorithm problem and have them try to solve the problem using their play money (this will prepare them for tomorrow's lesson.) Play the division song to give the class an idea of long division.

7. Evaluation of student learning

Observing the students word problems and solving each other's word problems will help me determine student learning.

8. Closure

Ask the class the following questions to conclude the lesson and to evaluate student learning:

- How can you use money to demonstrate a division problem?
- Can you demonstrate an example of using money for a division problem?

Math/Science- Monday and Tuesday (Day 5 and 6)
(Musical, Spatial, Linguistic, Logical, Kinesthetic, Interpersonal, Intrapersonal Intelligences)

Katie Riley — Fifth Grade

Mathematics/Dividing by 1-digit divisors — 10/10/2011

Math Standard 2
Computation
Students solve problems involving multiplication and division of whole numbers and solve problems involving addition, subtraction, and simple multiplication and division of fractions and decimals.

MATH 5.2.1 Solve problems involving multiplication and division of whole numbers fluently using a standard algorithmic approach and explain how to treat the remainders in division.

Science Standard 3
The Physical Setting
Students continue to investigate changes of Earth and the sky. They explore, describe, and classify materials, motion*, and energy*.

SCI 6.3.1 Compare and contrast the size, composition, and surface features of the planets that comprise the solar system, as well as the objects orbiting them. Explain that the planets, except Pluto, move around the sun in nearly circular orbits.

1. Materials
- White boards
- Workbook
- Karl Roemer's "Long Division Song"
- Class computer
- Clay
- Computer lab
- http://www.brainpop.com/science/space/solarsystem/
- Virtual Manipulatives:
  http://nlvm.usu.edu/en/nav/frames_asid_193_g_2_t_1.html?from=category_g_2_t_1.html

2. Objective
Students divide a large whole number by a one-digit divisor.

3. Motivation
Listen to Karl Roemer's "Long Division Song"

4. Goal for Learner
Today you will learn how to divide a large whole number by a 1-digit number without using a model.

5. Content and Procedures
- Tell the students that today we will be learning about the planets and about division.

Each group will be responsible for researching one planet and creating a scale model of their planet.

- Using the virtual manipulatives, show the students a visual representation for division.
- Using the division song, show the students the steps or rules to long division, using a division problem (divide, multiply, subtract, bring down)
- As I show the students the steps to long division, I will show the students where to place each number.
- Give the students a few sample problems to work on together with their group.

6. Practice/Application

- After the students have solved a few problems on their own, have the students solve a problem to find the scale model of their assigned planet.
- Then have the students mold their planet out of clay.
- Give the students differentiated worksheets for solving division. (a reteach one, a practice one, and an enrichment one)

7. Evaluation of Student Learning

The students' worksheets will help me to evaluate student learning.

8. Closure

Ask the class the following questions to evaluate student learning:

- What are the steps to long division?
- What does it mean to divide
- When would we use division?

Science- Monday (Day 5 part 2)

(Interpersonal, Spatial, Linguistic, Musical Intelligences)

Katie Riley Fifth Grade

Science/The planets 10/10/2011

Science Standard 3
The Physical Setting
Students continue to investigate changes of Earth and the sky. They explore, describe, and classify materials, motion*, and energy*.

SCI 6.3.1 Compare and contrast the size, composition, and surface features of the planets that comprise the solar system, as well as the objects orbiting them. Explain that the planets, except Pluto, move around the sun in nearly circular orbits.

English Standard 4
WRITING: Processes and Features
Students discuss and keep a list of ideas for writing. They use graphic organizers. Students write clear, coherent, and focused essays. Students progress through the stages of the writing process and proofread, edit, and revise writing.

ELA 5.4.1 Discuss ideas for writing, keep a list or notebook of ideas, and use graphic organizers to plan writing.

ELA 5.4.11 Use logical organizational structures for providing information in writing, such as chronological order, cause and effect, similarity and difference, and stating and supporting a hypothesis with data.

ELA 5.4.4 Use organizational features of printed text, such as citations, endnotes, and bibliographic references, to locate relevant information.

ELA 5.4.10 Edit and revise writing to improve meaning and focus through adding, deleting, combining, clarifying, and rearranging words and sentences.

1. **Materials**
   - Class computer
   - Clay
   - Computer lab
   - http://www.brainpop.com/science/space/solarsystem/
2. **Objective**

Students will create a PowerPoint slide about a planet.

3. **Motivation**

Listen to the planet song.

4. **Goal for Learner**

Today you will learn what qualifications are needed for a planet and then you will research a planet and create a PowerPoint slide about that planet.

5. Content and Procedures

Watch the BrainPOP video about the solar system.

- I will then discuss the rules for determining a planet in our solar system:

1) **It must orbit the sun directly, and not another solar system body.** (This lets out Ganymede, for example, which orbits Jupiter.)

2) **It must have sufficient mass to have reached hydrostatic equilibrium**: a near-round shape. (This removes most asteroids, which are too small for gravity to have rounded them off.)

3) **It must have cleared the neighborhood around its orbit.** (This eliminates Ceres, because it hasn't cleared its neighborhood of other asteroids; and Pluto, because it's locked into a different orbit with the much-larger Neptune.)

- I will also talk about the inner/outer planets and their composition
- Give each group a book about their planet. The group will need to research the mass, diameter, composition, location of their planet etc. They will record their information onto a graphic organizer. The information will then be placed on a PowerPoint slide, which will then be shared with the entire class.

6. Practice/Application

- Once the students have found the diameter of their planet, they will make a clay scale model of their planet to use during their presentation.

7. Evaluation of student learning

The students' scale models and presentations will be used to evaluate student learning.

8. Closure

The lesson will be concluded by the students' presentations. Ask the class to write one fact about each planet that they learned today. Put these planet facts on the bulletin board.

Math- Friday (Day 7)

(Spatial, Kinesthetic, Linguistic, Logical, Interpersonal, Intrapersonal intelligences)

Katie Riley — Fifth Grade

Mathematics/Understanding Factors — 10/13/2011

Math Standard 2
Computation
Students solve problems involving multiplication and division of whole numbers and solve problems involving addition, subtraction, and simple multiplication and division of fractions and decimals.

MATH 5.2.1 Solve problems involving multiplication and division of whole numbers fluently using a standard algorithmic approach and explain how to treat the remainders in division.

1. Materials

- PowerPoint about divisibility rules
- BrainPOP video: Factoring
- Computer and projector
- manipulatives

2. Objective

Students use divisibility rules to determine if a number is divisible by another and to find factor pairs of a given number.

3. Motivation

The students will watch the BrainPOP video about factoring (first half of video), which explains the purpose and examples of factoring.

4. Goal for Learner

Today we will learn some rules for dividing whole numbers.

5. Content and Procedures

- After watching the factoring video, ask the class for some other examples of factoring.
- Give the class manipulatives to physically find factors of numbers such as 12, 15, 16, and 20. Have the students work in their groups to find factors of these numbers. After we have discussed the factors for these numbers, give the students a larger number such as 3,816. Use this larger number to promote active inquiry, since the students could not use manipulatives for this number.
- Show the divisibility rules PowerPoint to introduce divisibility rules to the students.
- After the PowerPoint, give the student the same large number, and ask them to determine whether that number is divisible by 2, 3, 4, 5, 6, 9, and 10 using the divisibility rules.
- Create a class poster listing the divisibility rules for 2, 3, 4, 5, 6, 9, and 10
- Tell the students that a number will always have at least two factors, 1 and itself, unless the number is 1. Remind the students that a multiplication problem always shows the two factors for the product.
- To find the factors of a number, start by using the divisibility rules and divide by 2.

The quotient is the matching factor for that number.

6. Practice/Application

- Have the students practice finding factors of numbers on their whiteboards.

7. Evaluation of student learning

The students will be evaluated by informal questioning.

8. Closure

Ask the following questions to conclude the lesson and to evaluate student learning:

- What are the divisibility rules? Name them and what they are used for.
- How do you find the factors of a number?

Math- Monday (Day 8)

(Spatial, Kinesthetic, Linguistic, Logical, Interpersonal intelligences)

Katie Riley — Fifth Grade

Mathematics/Prime and Composite Numbers — 10/14/2011

Math Standard 2
Computation
Students solve problems involving multiplication and division of whole numbers and solve problems involving addition, subtraction, and simple multiplication and division of fractions and decimals.

MATH 5.2.1 Solve problems involving multiplication and division of whole numbers fluently using a standard algorithmic approach and explain how to treat the remainders in division.

1. Materials

- Divisibility chart
- White boards
- Note cards
- String
- BrainPOP video: Prime numbers: http://www.brainpop.com/math/numbersandoperations/primenumbers/
- Online interactive 100 chart: http://www.apples4theteacher.com/math/games/100-number-chart-one.html
- Student 100 chart worksheet

2. Objective

Students identify numbers as prime or composite and find the prime factorization of a number.

3. Motivation

Show the second half of the BrainPOP factorization video.

4. Goal for Learner

Today you will learn how to identify numbers with only one factor pair and numbers with more than one factor pair

5. Content and Procedures

- Show the students the divisibility poster we created yesterday. Review the meaning of factors.
- Explain to the students that prime numbers are numbers that can only be divisible by 1 and itself. Give the students an example of a prime number, and then ask for additional examples of prime numbers. Have the students use calculators to test the divisibility of each of the prime numbers. With the students, make a list of prime numbers from 1-50.
- Next, ask the students if they can decide what composite numbers are, based on what we know about prime numbers.

- Show the students how to create a prime factorization tree with a composite number.

6. Practice/Application

- The students will create their own prime factorization mobile using note cards and string.
- The students will need to first choose a 3-digit number and find the prime-factorization of their chosen number.
- They will then record their factorization on note cards and use the string to connect the note cards together into a mobile shape.
- Hang these around the classroom.

7. Evaluation of student learning

The students' factorization mobile will determine student learning of prime and composite numbers, factors, and prime factorization.

8. Closure

Ask the class the following questions to conclude the lesson and to evaluate student learning:

- What is the difference between a prime number and a composite number?
- How do you find the prime factorization of a number?
- What is the prime factorization of the following number? (Use the number 30)

Math-Tuesday (Day 9)

(Spatial, Linguistic, Logical, Interpersonal, Intrapersonal intelligences)

Katie Riley Fifth Grade

Mathematics/Problem Solving: Draw a Picture and Write an Equation 10/17/2011

Math Standard 2
Computation
Students solve problems involving multiplication and division of whole numbers and solve problems involving addition, subtraction, and simple multiplication and division of fractions and decimals.

MATH 5.2.1 Solve problems involving multiplication and division of whole numbers fluently using a standard algorithmic approach and explain how to treat the remainders in division.

Math Standard 7
Problem Solving
Students make decisions about how to approach problems and communicate their ideas.

MATH 5.7.1 Analyze problems by identifying relationships, telling relevant from irrelevant information, sequencing and prioritizing information, and observing patterns.

MATH 5.7.5 Recognize the relative advantages of exact and approximate solutions to problems and give answers to a specified degree of accuracy.

MATH 5.7.8 Decide whether a solution is reasonable in the context of the original situation.

MATH 5.7.9 Note the method of finding the solution and show a conceptual understanding of the method by solving similar problems.

1. Materials

- White boards
- Recording sheets
- Practice problems

2. Objective

Students use pictures and equations to help them represent remainders in a problem.

3. Motivation

Give the student a word problem about the planets and a recording sheet. Have the students work in their groups to solve the word problem any way they can.

4. Goal for Learner

Today you will learn to draw a picture to help you write a division equation that you can use to solve a problem.

5. Content and Procedures

- After the students have attempted to solve the word problems, I remind the students how to draw a picture for a word problem by asking them how we drew pictures for addition, subtraction, and multiplication word problems.
- Show the students how to draw a picture for a division word problem. Have the students draw a picture to the word problem on the recording sheet.
- Next, remind the students how we wrote equations for addition, subtraction, and multiplication problems. Show the students how to write an equation based on the picture drawn.
- Give the students another sample word problem to solve by drawing a picture and writing an equation.

6. Practice/Application

- Have the students write their own word problems for division, and trade with their group to solve each other's word problems.
- Tell the students that they need to include at least one word problem in their division game final project. Give the students some time to work on their project.

7. Evaluation of student learning

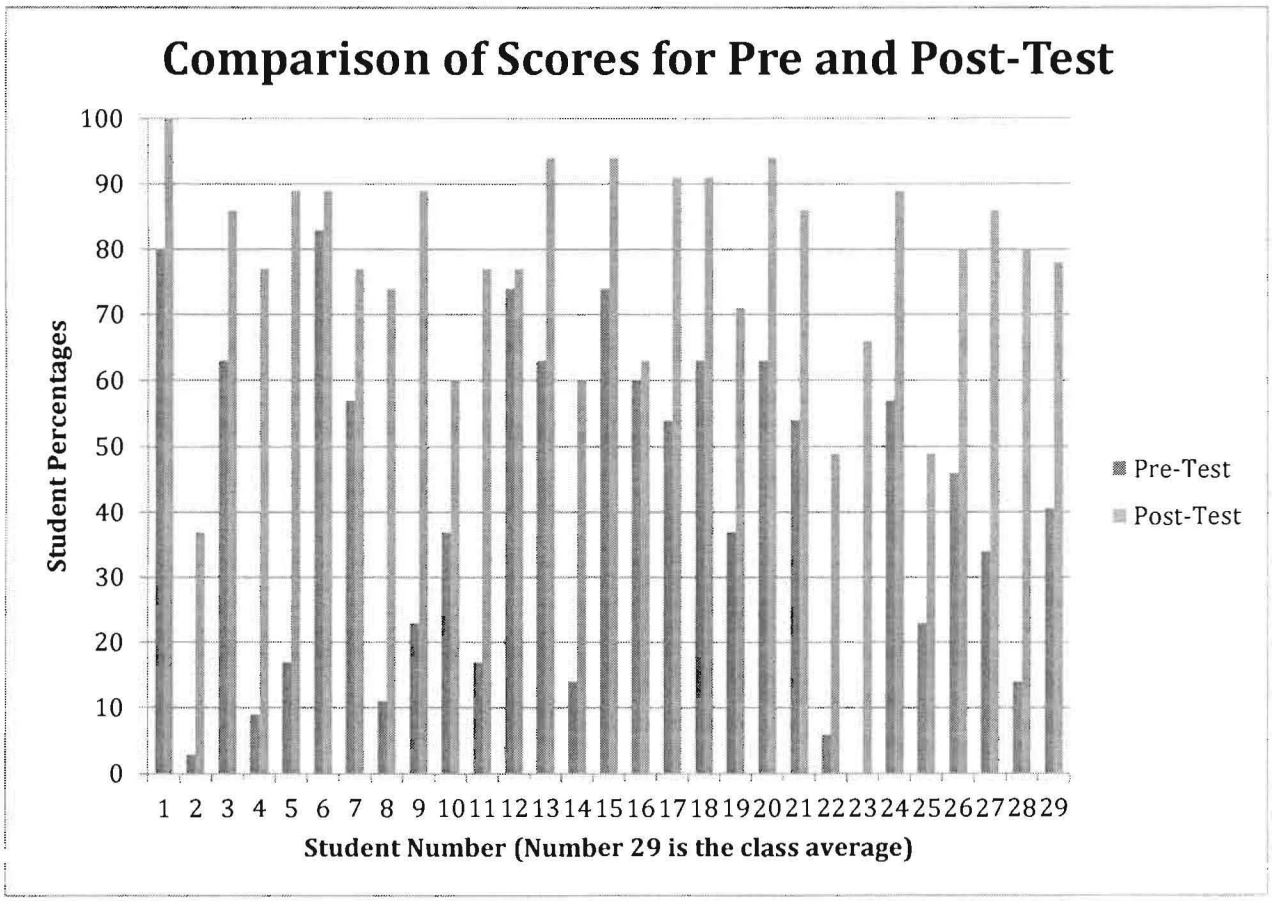
Observing the students word problems and solving each other's word problems will help me determine student learning.

8. Closure

Bring the class back together as a group. Ask the following questions to conclude the lesson and to evaluate student learning:

- What does it mean to draw a picture and write an equation for a word problem?
- Can anyone demonstrate how to draw a picture and write an equation for a given word problem?
- What does a variable mean and how do we use a variable when writing an equation or drawing a picture?

Pre and Post Test Results



Conclusion

After teaching my "Division Through the Solar System" unit, my students completed a project involving creating a game board that incorporates division and the solar system. I also administered a post-test that I used to compare student growth from before I taught the material and after I completed the unit. From the results, I saw a dramatic increase from the pre-test. Every student had improved over the course of the two-week period. The one problem I had with my unit is that I can not compare how my students would have done on the post-test if I had not incorporated my lessons with multiple intelligences. I do know, though, that some of my students definitely flourished with the multiple intelligences. For example, one student struggled every day with mathematical concepts, even basic math such as multiplication facts. When I played the division song for my class, this student would sing along with the song and do the movements for each division step. Then, when we started doing long division problems, this student would sing the song and do the movements to help her remember the steps to long division. I believe this student showed intelligence in musical and kinesthetic because she enjoyed working with her hands and songs helped her learn steps to long division. I also believe that the reason she struggled so much with math is because musical intelligence is often left out when teaching math since it is difficult to incorporate music in math. Another student never asked for help from the teacher, but based on the pre-test, class work, and homework, he really struggled understanding division. Therefore, I placed him in a group with strong math students who could help him when he was struggling. I noticed that he was much more likely to ask a fellow student for help, then to raise his hand and ask for my help. When we did group work, I walked around and was able to observe this student interacting with his group members and his group members explaining the steps to division. I believe this student had interpersonal intelligence because he learned best by being in a group and interacting with his group members.

Based on my research on the multiple intelligences and my real-life application of the intelligences, I have definitely noticed benefits to using multiple intelligences in the classroom. One benefit is that the teacher is teaching more towards the students and their individual intelligence strengths. When students realize that the teacher wants them to succeed by teaching the way that they learn best, they are more likely to be engaged in the classroom. Another benefit of the multiple intelligence theory revolves around the idea of keeping the students engaged and focused on the lesson. If a teacher lectured, a linguistic intelligence, the entire class period, the students learn to not pay attention to the teacher. Therefore, by including other intelligences during the class period, the students remain engaged in the material being taught. A final benefit to using multiple intelligences in the classroom is that the teacher can accommodate a wide range of ability in the classroom. Some students may be viewed as having a lower ability than another student, but as I saw in my unit, it is possible that student learns best by an intelligence that is not commonly used in the classroom (ex: musical or kinesthetic).

While I have discovered numerous benefits to using Howard Gardner's multiple intelligences in the classroom, there are also a few limitations to the theory. For example, I found it incredibly difficult to incorporate all seven intelligences into every single lesson

and activity for my unit, which is why I settled on using at least three intelligences in each lesson and using a variety of intelligences throughout the unit. I believe the difficulty in incorporating multiple intelligences into lessons is the reason many teachers refrain from differentiating and instead focus on the traditional idea of intelligence that has been used for decades. This idea being that students should accommodate their learning around the teacher's instruction. Another limitation to the theory is that the teacher needs to know her students very well in order to help determine which intelligence would be best for which child. If a teacher knows that one student is particularly interested in music, than the teacher should include the musical intelligence in her lesson for that student.

Based on my experience with attempting to differentiate a mathematics curriculum based on Howard Gardner's multiple intelligences, I have grown as a teacher. I have learned how to differentiate lesson plans and activities in order to best benefit my students and their learning experiences. Using the multiple intelligences, I have become closer with my students because I learned what they were interested in and how they learned best. For example, I found out that one of my students really enjoys when a song is included in the lesson, therefore showing that she has musical intelligence. I know that my students appreciated when I taught to their learning intelligence, rather than just teaching from the textbook or lecturing them. After I graduate from college, I hope to use what I have learned, from implementing this curriculum unit, in my own classroom. I have learned that differentiating material is not extremely difficult, and while it is a little time consuming, the students benefit greatly from a lesson that is differentiated rather than a textbook lesson.

Resources

Resources used for research of multiple intelligences:

Gardner, Howard. *Multiple Intelligences: The Theory in Practice.* New York NY: Basic, 1993. Print.

Wahl, Mark. *Math for Humans: Teaching Math through 8 Intelligences.* Langley, WA: LivnLern, 1999. Print.

Resources used for the classroom:

BrainPOP - Animated Educational Site for Kids - Science, Social Studies, English, Math, Arts. Web. 5 Oct. 2011. <http://brainpop.com>.

Clark, Ron. "Solar System Wisdom." Song

Space: A Visual Encyclopedia. London: DK, 2010. Print.

Knapp, Brian J. *Earth and Moon.* Danbury, CT: Grolier, 2004. Print.

Knapp, Brian J. *How the Universe Works.* Danbury, CT: Grolier, 2004. Print.

Cirou, Alain. *Incredibly Far.* New York: New Discovery, 1993. Print.